

CLAIMS

- 1 1. A device for manipulating microwave radiation,  
2 comprising:  
3 a substrate that defines the shape of a surface for  
4 reflecting microwave radiation; and  
5 a metal fitting conforming to the defined shape, and  
6 providing the surface that reflects microwave  
7 radiation.
- 1 2. The device of claim 1 wherein the surface defines at  
2 least a portion of a microwave resonant cavity.
- 1 3. The device of claim 1, wherein the metal fitting has a  
2 thickness of greater than 10  $\mu\text{m}$ .
- 1 4. The device of claim 1 wherein the surface defines at  
2 least a portion of a microwave reflector.
- 1 5. The device of claim 1 wherein the substrate comprises an  
2 insulator.
- 1 6. The device of claim 1 wherein the thickness of the metal  
2 fitting is less than 500 $\mu\text{m}$ .
- 1 7. The device of claim 5 wherein the thickness of the metal  
2 fitting is less than 100 $\mu\text{m}$ .
- 1 8. The device of claim 1 wherein the substrate has a  
2 coefficient of thermal expansion less than  $5 \times 10^{-6}/^{\circ}\text{C}$ .
- 1 9. The device of claim 1 wherein the metal fitting has a  
2 coefficient of thermal expansion greater than  
3  $10 \times 10^{-6}/^{\circ}\text{C}$ .
- 1 10. The device of claim 1 further comprising a braze joint  
2 that bonds the metal fitting to the substrate.
- 1 11. The device of claim 1 wherein the metal fitting  
2 comprises silver.
- 1 12. The device of claim 1 wherein the metal fitting

2 comprises a wrought metal.

1 13. The device of claim 1 wherein the metal fitting  
2 consists of a metal that is at least 99% pure.

1 14. The device of claim 1 wherein the metal fitting is  
2 bonded to the substrate via an interference fit.

1 15. The device of claim 1 wherein the metal fitting has a  
2 machined surface.

1 16. The device of claim 1 wherein the metal fitting  
2 completely shields the substrate from exposure to the  
3 microwave radiation.

1 17. The device of claim 1 further comprising an adhesive  
2 layer between the substrate and the metal fitting.

1 18. The device of claim 17, wherein the adhesive layer has  
2 a thickness of less than 1.0  $\mu\text{m}$ .

1 19. The device of claim 1, wherein the metal fitting has a  
2 ring shape having an inner diameter and an outer  
3 diameter.

1 20. The device of claim 19, wherein the inner diameter is  
2 machined to match an outer diameter of the substrate.

1 21. The device of claim 19, wherein the outer diameter is  
2 machined to match an inner diameter of the substrate.

1 22. The device of claim 1, wherein the substrate and the  
2 metal fitting have a compatible thermal behavior.

1 23. A method for making a device for manipulating microwave  
2 radiation, comprising:

3 providing a substrate that defines a shape of a surface  
4 for reflecting microwave radiation;

5 providing a metal fitting having a sufficient thickness  
6 to provide mechanical stability; and

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7 bonding the metal fitting to the substrate, the metal  
8 fitting providing the surface that reflects microwave  
9 radiation.

1 24. The method of claim 23, further comprising thinning the  
2 metal fitting to provide the surface after bonding the  
3 metal fitting.

1 25. The method of claim 24, wherein thinning the metal  
2 fitting comprises machining the metal fitting.

1 26. The method of claim 23, wherein providing the metal  
2 fitting comprises machining the metal fitting prior to  
3 bonding the metal fitting to the substrate.

1 27. The method of claim 23 wherein the metal fitting has a  
2 thickness of greater than 500µm.

1 28. The method of claim 23, wherein providing the metal  
2 fitting comprises casting and deforming the metal  
3 fitting.

1 29. The method of claim 23, wherein bonding comprises:  
2 providing a brazing layer between the metal fitting and  
3 the substrate; and heating the brazing layer to a brazing  
4 temperature.

1 30. The method of claim 23, wherein bonding comprises  
2 providing an epoxy layer between the substrate and the  
3 metal fitting.

1 31. The method of claim 23, wherein bonding comprises  
2 providing a compression fit.

1 32. The method of claim 31, wherein bonding further  
2 comprises: cooling the metal fitting; placing the metal  
3 fitting adjacent to the substrate; and causing the metal  
4 fitting to warm to an original temperature.

1 33. The method of claim 31, wherein bonding further

2 comprises: heating the substrate; placing the metal  
3 fitting adjacent to the substrate; and causing the metal  
4 fitting to cool to an original temperature.

1 34. The method of claim 23, wherein bonding comprises:  
2 packing an elastomer against the metal fitting; and  
3 applying a pressure to the elastomer to cause the metal  
4 fitting to deform.

1 35. The method of claim 34, wherein bonding further  
2 comprises disposing an adhesive layer between the metal  
3 fitting and the substrate, the adhesive layer having a  
4 thickness of less than 1.0  $\mu\text{m}$  after applying the pressure  
5 to the elastomer.

1 36. The method of claim 23 wherein the metal fitting has a  
2 circular shape having an inner diameter that matches an  
3 outer diameter of the substrate to a radial tolerance  
4 sufficient to provide a stable fit between the metal  
5 fitting and the substrate.

1 37. The method of claim 36 wherein bonding comprises  
2 providing friction between the metal fitting and the  
3 substrate to assist the stable fit.

1 38. The method of claim 36 wherein bonding comprises  
2 providing an adhesive between the metal fitting and the  
3 substrate to assist the stable fit.

1 39. The method of claim 23 wherein the substrate comprises  
2 an insulator.